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Serrell, J. E.

COMPILATION OF FACTS

REPRESENTING THE PRESENT CONDITION OF THE

SEWERS

AND THEIR DEPOSITS

IN THE

City of New York.

Respectfully Dedicated to the Metropolitan Board of Health,

BY JAMES E. SERRELL,

City Surveyor and Civil Engineer.

JAMES E. SERRELL,
CITY SURVEYOR
AND
CIVIL ENGINEER.
No. 43 West 26th Street,
Bet. Broadway & 6th Avenue. NEW YORK.

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COMPILATION OF FACTS.

THE drainage of large cities and the best mode of its accomplishment, for the purpose of promoting the public health and convenience, is a problem, the solution of which has long occupied the attention of sanitarians as well as scientific, commercial and business men. The continued accumulation of filth in every large city is so great, and increases every year, that the deposit, carried by the water into the sewers and drains, fills up the rivers into which it is emptied. The recently published account of detriment to the river Thames and its vicinity, where the public sewers are connected with it, is a notable instance, and almost sufficient to destroy the use of property near to such exit.

From the New York Daily Tribune, July 1st, 1864.

"Precisely what we have done and are doing, London has done. The sewage being an offensive thing, it was got rid of the quickest way by carrying it into the Thames; in other words, the Thames was made a great open main sewer. But it was found by experiment that floating matter did not go to sea, but only moved back and forth between the bridges; the river became a stench pool, so nauseous as sometimes to compel the adjournment of Parliament; although lime and chloride of lime were thrown daily into it by the ton, the evil was not remedied; but now London is beginning to examine the subject in a more sensible light. Many sewers could empty only at low water, and thus the same re-flow from the tide occurred which takes place in the Fifth Ward and elsewhere here. "The returning flood swept all the nauseous flotsam and jetsam back into the heart of the metropolis, and kept it churning backward and forward in the open air." This, however, was in the river itself; but now, the "intercepting plan" has been adopted, which, says the *Times*, 'consists in cutting three great main drains on both sides of the river, and which instead of running due north and south, like the present system, run from west to east. These great main lines intercept and cut off all the existing lines of drains from the river, carry their contents away down to below Barking Creek and Erith marshes, where they are poured into gigantic reservoirs, and afterward, when deodorized, turned into the river at high tide and swept away by the ebb almost to sea. Thus the sewerage is not only turned out free from smell, but turned out into a body of water nearly thirty times as great as that into which it used to be poured, and instead of poisoning the air at our very doors, becomes lost in the volume of water which rolls down between the marshes on each side of the river to far below Gravesend. Precisely similar to this is the plan mentioned on page 23, of the volume lately issued by the Citizens' Association.* The Croton Aqueduct Department, however, is desirous of building sewers along the river front to cut off the present sewers, and carry their discharge to certain points, as at the Battery, &c., where their contents can be at once thrown into the currents of deep water."

The City of New York as a commercial emporium, is second to none in the world, and the shipping interest has been fully discussed as to "harbor encroachments," by building docks and filling in to the rivers, forming a boundary line all around the city, which says "thus far shalt thou go and no farther." By reference to the Coast survey of 1859, Appendix No. 13, pages 132 and 136, we learn facts of interest in this matter, but the cause is not given.

LT. T. A. CRAVEN, *Assistant in the Coast Survey*, says: "Next in order, is the sewerage. It has been ascertained that the slips in the harbor have been filled up nearly eighteen inches each year by material discharged from the sewers, of which only four out of one hundred and ten, discharge at the outer end of the piers, the remainder discharge into the still waters of slips or basins, where there is no current to carry off the deposits."

"SECTION I. From PIER No. 1, North River, to CASTLE GARDEN. In the angle formed by the line of the Battery and the Pier, there has been a very rapid filling up; the three fathom curve has been pushed outwards 80 yards beyond the line of 1856; the 17 feet spot in the outer part of this section is extending towards Pier No. 1, and there is an average decrease of three feet in depth throughout this section.

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* Dr. Hampton Harriott—Dr. James Ross, 15 D——— p. 173.

"SECTION II., extends to the 3 fathom curve of 1856. In this portion of the shoal has been not less considerable than in the angle of Pier No. 1. The 3 fathom curve was, in 1856, about 75 yards south of the Castle, it will be seen that it has extended towards the Castle wharf, and embraces a considerable area where formerly we had five fathoms; outside of this curve, we find in this section a general decrease of five feet in the depth."

"SECTION III, embraces the general shoal to the south-eastern portion of the curve of 3 fathoms. Excepting in the part already indicated, there has been no material change in the general contour of the shoal, but in following the curve to its southernmost point it will be seen that it has extended about one hundred feet to the southward."

"All parties encroaching upon the waters of the harbor, beyond the established limits, should be punished by sufficient penalties, and the Harbor Commissioners should have power to remove the encroachments at once, the offending parties to pay all expenses incurred in such removal. All new sewers should be carried to the outer ends of the piers, (which we believe to be the intention of the Croton Aqueduct department, which has charge of the construction of the sewers), and where practicable, the termination of those now built should be changed so as to empty in like manner with the new ones."

"The cisterns at the corners of the streets, communicating with the sewers should invariably be cleaned out weekly, which would be the great preventive of filling up the slips from the sewers."

THE MUD DREDGING THE CITY—

Cost in 1859	$37,472.47
" 1860	67,236.67
" 1861	62,224,81
" 1862	18,636.14
" 1863	25,883.32
" 1864	10,338.28
" 1865	113,629.70

The proportional amount done by the city is about as much as done by other owners of docks and slips. This mud is washed into the rivers by heavy rains, and we often remark "how clean the streets are after the rain last night," forgetting that we are relieved at the expense of the shipping interests in our harbors, and to the filling up and obstruction of our sewers.

Also from the Tribune of 1*st July*, 1865. "The present system of sewerage proceeds upon the childish presumption that, when the sew~~er~~age is put out of sight, it is effectually disposed of. In other words, the system is not a system at all, but only a plan of getting the sew~~er~~age underground and then leaving it to take its own course, precisely as if it were clean water, which rapidly finds the lowest level and without offence to any body while doing so. The principles of hydraulics are few and and simple, but may not be changed, and the difficulties in the case are immensely aggravated by the solid matters mingled with the waters. And all plans hitherto tried of dealing with sew~~er~~age have considered it only a nuisance to be got rid of, whereas it is really a thing of value to be utilized. In discharging it into the rivers, we have been really casting bread upon the waters, without hope of ever seeing it return. Like barren New England, which gets rich by selling her disadvantages, New York may sell this seeming disadvantage."

I would here call attention to the following *extract from a Report on the result of observations upon the deposit of dirt or silt in the harbor of New York, made during the year* 1854–1857, *by Chas. H. Haswell, Engineer.* "In the prosecution of my observations, I selected 16 locations which I thought best suited to furnish me with the elements desired, and providing myself with an equal number of bottles, of like capacity, (30 cubic inches,) I repeatedly filled one of them with water from each of these localities at half tide; (both ebb and flow,) both in dry and wet weather, and at different seasons of the year; such water was then filtered and the residuum weighed and noted in grains, the average results of which, deduced from the operations of several years, furnish the following:

Weight in grains, of deposits in 30 cubic inches of water from the following localities:

	GRAINS.
Sandy Hook	109
Narrows	265
Robbins' Reef	367
Ellis' Island	811
Battery	1.687
Liberty Street	6.927
Canal Street	8.531
30th Street, West	937
Manhattanville	578
Harlem Bridge	1.032
Hell Gate	1.093
30th Street East	1.265
23d Street	2.968
Grand Street	4.000
Wall Street	5.187
Broad Street	6.375

The mean result of which is 2.633 grains in every 30 cubic inches of water.

Confining my observations to the City of New York alone, and taking the deposits shown in the water from the several localities around the city, the mean amount of silt in every 30 cubic inches of water is as follows:

Battery	1.687
Liberty Street	6.937
Canal Street	8.531
30th Street, East	1.265
23d Street	2.968
Grand Street	4.000
Wall Street	5.187
Broad Street	6.375
30th Street, West	937
	9) 37.887
	4.200

Hence, by the elements before given, it appears that the volume of the deposit from the water in the slips of this city between 30th street east and west, and the Battery, compared with that of the water (at half tide) is as 1 to 3.610.

Startling as these results appear, it must be borne in mind that they do not give a full exhibition of the facts of the case, for the observations made were necessarily confined to presence of silt, and embraced only that portion which was retained in suspension by the flow of currents, whilst the deposit of *detritus* from the flow of gravel, sand, &c., could not be arrived at, unless by a different system of observations, and is consequently, not embraced in the above results.

In corroboration of these results, and in illustration of the effects under consideration, the proprietors of the N. Y. Sectional Dock assure me, that the deposit of ~~sli~~silt upon their tanks between the piers of Market and Pike streets, averages full five-sixteenths to three eights of an inch in one flow of tide, and they are thereby subjected to the delay and cost of dredging under their dock to the depth of seven feet every two years.

The opinion appears to prevail with the public that the discharge from our sewers and the deposit removed from the slips into the rivers, are washed, as it is termed, into the sea and Long Island Sound. If this were the operation it would be well for the interests involved in the subject under discussion; but as it happens, a very brief examination of the case presents a very different result. Thus, the deposits in our slips; i. e., mud, independently of stones, bricks, &c., is composed of gravel, sand, clay and feculent matter, which when transferred to the channels of the rivers is submitted to the detrital action of a current of from three to four knots per hour, 18 miles distant from the sea; with these elements then, it would be difficult, to show how any portion of this mud, other than the soluble part of it, and the coloring matter therein, could ever reach Sandy Hook."

That the system of the dredging of our slips as now pursued, viz: the removal of the deposits therein from below low water depth, to be exposed to the currents in the rivers, ends in but a transfer of them to other slips and shoal places; the effect of which is to involve the loss of time and cost of a re-removal of the deposits from the slips.

The Report of the Council of Hygiene of the Citizens' Association contains many facts of interest on this subject. To a few of these I will now call your attention.

3rd

HAMPTON HARRIOT, M. D., *Sanitary Inspector of the District, says:* "All the sewers of the 3d District empty into the slips between the wharfs along the North River, with the single exception of the Canal Street sewer and its connections, which empty at the head of the long pier at the foot of Canal Street, and in deep water. This system of emptying the sewage into the slips is a prolific source of offence to the senses and of disease to the District, and also keeps the city at continual and great expense for the necessary dredging to keep them navigable and prevent their filling up. The Croton Aqueduct Department, however, is desirous of correcting this, by building sewers along the river front, to cut off the present sewers, and carry their discharge to certain points, as at the Battery, &c., where their contents can be at once thrown into free currents of deep water, thus avoiding these difficulties. This system regards the sew~~er~~age as of no value, but the time will probably soon arrive when some plan will be desirable to save it and make it valuable." (*Page* 23.)

JAMES ROSS, M. D., *Sanitary Inspector of the* 15*th District, says:* "The tides force back the contents of the sewers throughout the lower level of the District, and thereby cause a noxious reflux of sewer gases. The importance of sewer and drain traps is here illustrated. Many of the houses are not connected with the sewers, and this circumstance adds to the filthiness and insalubrity of the district. In scarcely any other section of the city can the importance of thorough sewerage and skillful house drainage and sewer trapping be more forcibly illustrated. Of course it is not necessary that the sanitary inspector should present to a council of medical gentlemen, any argument in support of the assertion that we must attribute to the imperfections of the sewerage, much of the typhoid fever as well as other prevalent maladies of the low districts of the city. The old farmers who owned these low grounds in early times had them drained by deep ditches, simply with reference to pecuniary advantages to themselves; how much greater the importance and economie value of thorough drainage of the same region, now that a population of sixty thousand people have made their homes upon the crowded squares that cover these old marshes." (*Page* 173.)

GUIDO FURMAN, M. D., *Sanitary Inspector of the* 17*th District,* *says:* "In the putrefactive decomposition of sewerage, evolving sulphuretted and carburetted hydrogen, ammonia, nitrogen, etc., etc., we have an invisible yet obvious source of a large amount of poisonous elements." (*Page* 199.)

ROBERT NEWMAN, M. D., *Sanitary Inspector of the* 13*th District, says:* "No community and no city can preserve a wholesome condition without supply of pure water; and an equally thorough purification from all refuse. To properly arrange this double circulation in a large house, is a matter of no trivial consideration; how much more, then, is skill, sagacity, and system, necessary for the sufficient supply and drainage of a district of an immense city like New York?" (*Page* 144.)

HAMPTON HARRIOT, M. D., *Sanitary Inspector of the* 3*d District, says:* "The piers, wharves, etc., fronting the 3d District, are generally in a dilapidated and neglected condition, though a few occupied by steamship lines are kept in very good order, being enclosed with sheds and gateways. All the piers, however being built of wood, necessarily furnish a large amount of decaying vegetable matter, which is known to be a prolific source of disease. The slips, in consequence of receiving the sewerage of the district and surrounding parts of the city, are generally foul, and the undoubted source of much sickness. I have seen a number of cases of severe disease, such as fever, congestion of the brain, liver, etc., induced by bathing or getting overboard in the slips of this district." (*Page* 28.)

J. W. PURDY, M. D., *Sanitary Inspector of the* 3*d District says:* "The piers, four in number, are in very fair condition; the basins need dredging, for at low water they are nearly bare, and in warm weather emit a most intolerable stench from the reekng slime, the dead animals, entrails, etc., which collect in them and undergo putrefaction during the summer." (*Page* 72.)

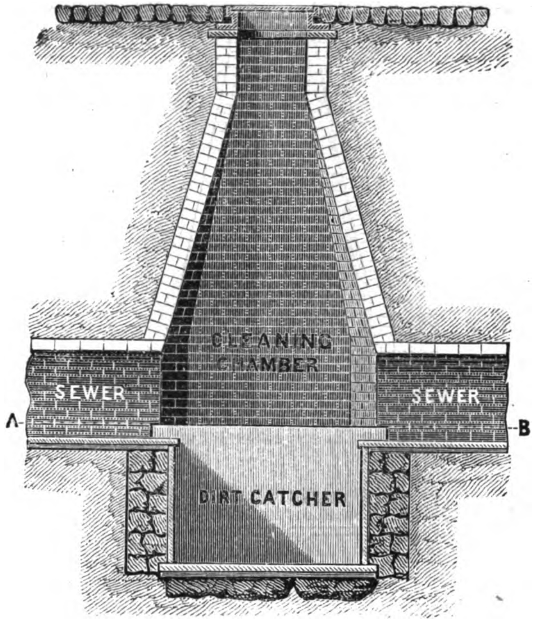
EDWARD W. DERBY, M. D., *Sanitary Inspector of the* 14*th District says:* "Sewers exist I believe in every street; are for the most part connected with the houses, and generally suffice for their drainage, but in not a few instances these become choked, and contribute their share of fœted exhalations to the general insalubrity." (*Page* 165.)

E. H. JANES, M. D., *Sanitary Inspector of the* 20*th District says:* "My attention has recently been called to a sewer in 27th St., built in the year 1850, by J. E. Serrell, of this city; civil engineer and one of our city surveyors, which not only obviates this difficulty, but possesses other advantages not claimed for any system of sewerage, with which I am acquainted. The improvement consists in deep vaults called "dirt catchers" along the course of the sewer, at such distances apart, and of such a depth as to secure the collection and retention of the night soil and solid matter washed from the streets into the sewer. This solid material, sinking to the bottom of the vault, and consequently under water, will emit little or none of the offensive effluvium so repulsive to our senses. By constructing these "dirt catchers" at proper distances apart, nearly all of the matter otherwise carried into the river, or deposited along the bottom and sides of the sewer, will be collected, for what passes over one vault the force of the current will suffice to carry to the next, leaving the sewer always clean and unobstructed. When the vaults are full they will of course require to be cleaned: and for this purpose they are built in two compartments, by means of a longitudinal partition, and so arranged that the whole current may, by means of a small temporary dam, be made to pass either compartment, while the other is being cleaned. This temporary dam is afterwards removed to the other side of the sewer, and the current turned through the side of the vault just cleaned, while the remaining one is undergoing the same process. This arrangement gives the men full liberty to work at the best advantage, while the restrained and uneasy position which they are compelled to assume while at work in the ordinary sewer, enables them to accomplish but little in a given time. There are also four of these dirt catchers in the Fortieth Street sewer, between 9th and 10th Avenues, of sufficient capacity to contain one hundred loads each, and which have been cleaned twice since their construction, at an expense of only from five to ten per cent, of what it would cost to remove the same bulk of material from the ordinary sewer. In addition to the advantage gained in cleaning, we not only relieve our city in a great measure from the offensive sewer smell, prevent an accumulation of filth in the rivers around our wharves and piers, but we are enabled to save to the country a vast amount of fertilizing material hitherto regarded by agricultural writers as the great waste of cities.

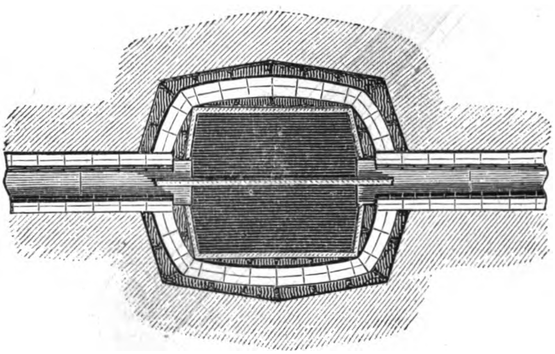
These vaults in Fortieth Street sewer are two hundred feet apart, and receive all the mud and dirt which would be otherwise washed into the river, or adhere to the bottom and sides of the sewer. It would at first view seem an expensive undertaking to construct these vaults in all the sewers throughout the city; but, in view of the great relief to our rivers, the increased facilities for cleaning, the suppression of the sewer gases, and in the immense saving to our agricultural districts, this expense would soon be cancelled even as regards the old sewers, whereas they could be applied to sewers in the process of construction, and the additional expense saved by the construction of fewer man-holes, and building the sewers of a diminished area, their present large size being necessary only for the purpose of allowing workmen to enter when cleaning is ordered, which, with the improvement suggested, would be wholly unnecessary." (*Page* 233.)

The subject of sewerage and drainage has engaged my attention for over *twenty* years, and I constructed a sewer on this proposed plan, by private contract, in 27th Street, between 6th Avenue and Broadway, in the year 1850. This sewer was 361 feet long, and had in it two "dirt catchers," which are as shown in the following wood cuts. The cost was $995.29, including the sewer, "dirt catchers," and all expenses; or about $41.00 for each lot of 25 feet front, which will compare favorably with the cost of any sewer built before or since that time. The owners of lots who paid for this sewer, were, the Hon. Isaac L. Varian, ex-Mayor of the City of New York; Starks W. Lewis, Esq., G. W. Varian, Esq., Mr. Alexander, and others.

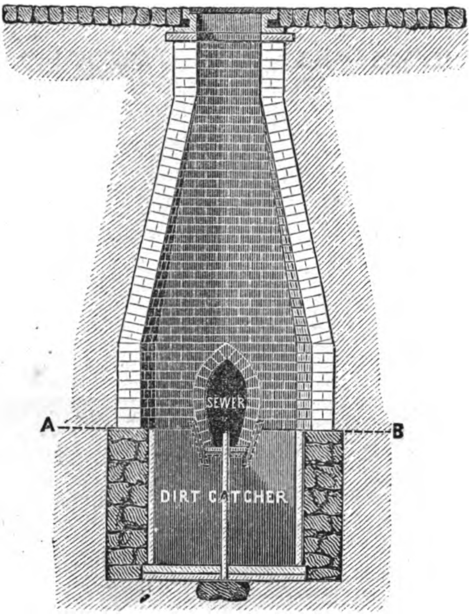
LONGITUDINAL SECTION.



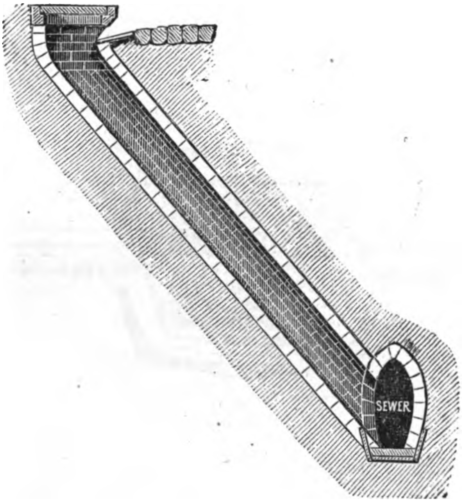
PLAN AT LINE A. B.



CROSS-SECTION.



CULVERT OR SLUICE.



IMPROVEMENTS IN THE MODE OF CONSTRUCTING COMMON SEWERS.

The description of its mode of construction is shown on the engraving, which explains its uses, and advantages, and its application to all sewers now built, without changing them in the least, unless improperly built or out of order.

First. To be placed in the sewers at about two hundred feet apart, and below the bottom of the sewers.

Second. The passage of the water and dirt into each of the dirt catchers, the dirt is nearly all deposited in the chambers of the dirt catchers before it reaches the end of the sewers.

Third. The size of the sewers can be as small as requisite for the largest amount of water to pass, as workmen will not be required to go into the sewers to clean them out.

Fourth. The straight sides and narrow bottom of flag will not allow the dirt or filth to lodge, and affords but small chance for rats to build on the sides of the sewer.

Fifth. The great advantages of cleaning are, that the dirt is deposited in the dirt catchers by the action of the water running in the sewers; and the easy mode of working in them, being formed in two compartments which prevents the water which is always running in the sewers, from coming in contact with the men at work cleaning out the dirt, or the trunk or trough spoken of if the centre flag is not used.

Sixth. The amount of dirt not carried into the slips and rivers, which now forms mud flats, requiring to be taken out by mud-machines; thousands of loads of dirt are now carried into the rivers and slips by each rain, or deposited in the sewers. (*See Police Report* 1865, *Page* 74.)

Seventh. The great advantage to the shipping interests by not allowing this offensive matter to pass into the slips and rivers to the detriment of the owners of land at the river, and those engaged at the docks and on vessels, the dirt catcher not smelling until full of mud at which time it requires to be cleaned.

Eighth. The easy or convenient mode of construction by the use of a pipe or trunk placed in the sewers now built or to be built, to pass the water during the construction of the dirt catcher to prevent the water which is nearly always running in the sewer, from passing into the space in which the dirt catcher is being constructed.

Ninth. That by the use of these dirt catchers the receiving basins at the corners of the streets, could be dispensed with, also at least one half the number of man-holes, the non use of both would lessen the cost of construction and sewers would be built with these advantages at about the same cost per mile as now.

Copies of the profile of the sewer in Twenty-seventh Street, also plan and description of the "Dirt Catcher," were filed in the Croton Aqueduct Department before the work was commenced, also plan of those built in Fortieth Street between 9th and 10th Avenues, the Croton Aqueduct Department having had *charge* of ~~the work~~ sewers for about *sixteen years.* The iron-heads of the man-holes in street, formerly had about nine small holes in them to let the gases out and an expensive trapped basin at the corners of the streets, often within thirty feet of them, to keep the gases in, and all ~~still~~ yet remains unchanged.

CROTON AQUEDUCT DEPARTMENT.

Extract from Specification No. 38 for sewer *in Fortieth Street, dated June,* 1858.
JAMES E. SERRELL, *City Surveyor in charge of the work.*

MODE OF CONSTRUCTION FOR THE DIRT CATCHERS.

The excavations for Dirt-Catchers are to be made at such points as may be designated. Three longitudinal courses of large flat foundation stone, (set transversely with the line of the sewer,) are to be bedded firmly, for the support of the outer walls and the inner flagging. The dimensions of the inner flags are to be as follows: the centre perpendicular flag to be ten feet long, six feet six inches high, and two and half inches thick, and set so as to coincide with the longitudinal diameter of the sewer, and so that the top line will be six inches above the inner bottom of the sewer. Two bottom flags, each to be four feet wide and nine feet long on the inner side, and to be bevelled regularly on each end, so as to be eight feet long on the outer side are to rest evenly and firmly on the foundation stones. The side and end flags to be each six feet six inches high, and cut and fitted around the bottom flags with an "area lock" as shown on said plan; all joints to be dressed smooth and closely fitted, and all flags to be not less than two and a half inches thick.

A wall of stone, laid in cement mortar, is to be built around the outside of the outer flags, and to a level with the top of the same, except where the sewer connects; this wall to be not less than two feet thick, with the stones so laid as to form an arch to resist the lateral pressure; on this stone wall is to be laid as high as the extrados of the sewer, a vertical brick wall eight inches thick, forming on each side the segment of a circle, curving on the sides and ends from the chord line one foot two inches; in this is to be worked the ends of the sewers;—this wall is then to be continued up with a regular inward slope, to within sixteen inches of the surface of the street, where the opening will be two feet square inside in the clear, and upon which are to be set the stone coping and manhole head and cover, as described for the manholes.

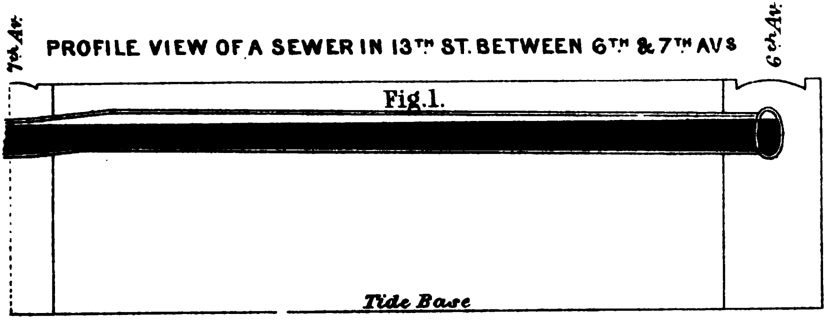
Extract of the annual Report of the Board of Metropolitan Police for 1866. (*Page* 68.)

The present condition of the City has been carefully examined, and we have found it in a state (especially in view of an anticipated invasion of the cholera) demanding the gravest consideration. A very great portion of it is in a most imperfect and inefficient condition. Many of the sewers built by contractors (the contractors only work by plans made before they bid on the work) ignorant of or indifferent to the simplest principles of sewerage, are wholly inadequate to carry off the refuse which their construction contemplated. Others are dilapidated and thus incapable. Others still, open into bulkheads instead of the tideway, and others even into vacant lots. Through the kindness of Mr. Theodore Weston, chief engineer of the bureau of sewers of the Croton Aqueduct Department, we have been furnished with section and profile drawings of some of the sewers, showing their present condition, which better than any written account, will give an idea of the magnitude of the evils which exist in our system of sewers at the present time.

By examination of the result of the recent surveys, at the bureau of sewers, we have asertained that the sewer in East Twenty fourth street, between Madison and Fourth avenues, has a desending grade of but four inches in seven hundred feet, which is equivalent to stagnation. In the sewer in Twenty-sixth street, between Second and Third avenues, there is an ascending grade of three feet and two inches to be overcome by accumulated deposits before any flow can occur. The size of this sewer is four feet by two feet and eight inches. In Madison avenue, between Thirty-third and Thirty-second streets, the sewer rises against its grade eleven inches in two hundred feet (*the sewer is not built to the proper depth south of these points, and was so reported by G. W. Varian and James E. Serrell, City Surveyors, from actual surveys made when the sewer was in progress, and before it reached the plans named,) in Thirty-third street it is against grade eight inches in two hundred feet, (*) in Thirty-fourth street, between Fifth and Madison avenues, the sewer rises

PROFILE VIEW OF A SEWER IN 13TH ST. BETWEEN 6TH & 7TH AVS

Fig. 1.

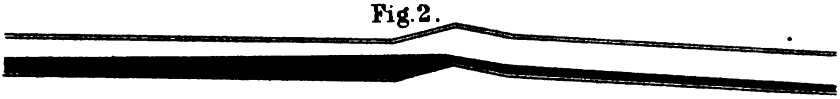


The annoyance from foetid odors so great in the neighborhood of 13th & 14th Sts and 6th Avenue is readily explained by the above sketch, as the same condition is present in each locality.

The Black shading represents the sewage deposit which will be seen almost completely to fill the sewer; —— on account of its faulty construction this deposit must of nescessity accumulate untill the grade is overcome, before there can be any flow at all. The Red line shows the size of the sewage stream.

PROFILE OF A SECTION OF A SEWER IN 19TH ST. BETWEEN 6TH & 7TH AVS

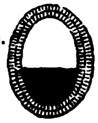
Fig. 2.



SECTIONS OF SEWERS IN CANAL, DIVISION & ELDRIDGE STS

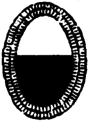
IN CANAL, *East of Eldridge St.*

Fig. 3.



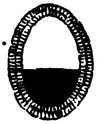
IN ELDRIDGE, *South of Canal St.*

Fig. 4.



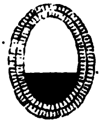
IN DIVISION, *East of Eldridge St.*

Fig. 5.



IN DIVISION, *West of Eldridge St.*

Fig. 6.

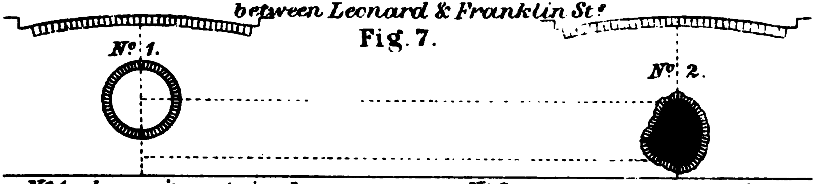


The Black shading shows the permanent deposit.
The Red the size of the sewage stream.

SECTION OF THE SEWER IN CENTRE ST.

between Leonard & Franklin Sts

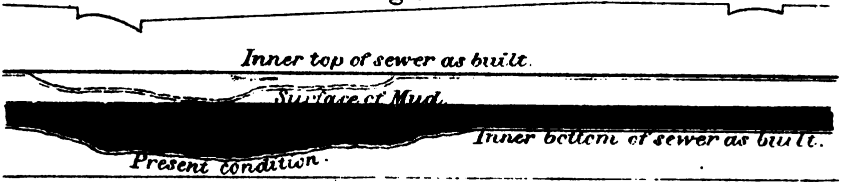
Fig. 7.



No. 1 shows its original appearance. No. 2 its present dilapidated and clogged condition.

PROFILE VIEW OF SAME SHOWING THE CAUSE OF THE OBSTRUCTION.

Fig. 8.



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two feet in 250 feet. The above examples are by no means exceptional. In a communication on this subject, from Mr. Weston, engineer of sewers, dated November 14th, 1865, he says: "The same accumulation of deposit, seen in Thirteenth street, extends up and down in Sixth avenue, thence into Fourteenth street along and past Union square." (* The accumulation of dirt in the sewers often decreases the capacity of the sewer to such an extent, that the size of the sewer is said to be too small, when if free from dirt, or clean, would pass twice the volume of water*) He further remarks: "It is, perhaps, not at all times so aggravated as shown in the accompanying sketch (*see plate fig.* 1.) but, during the dry and hot months, especially in August, September and October; when the poisonous gases can inflict most injury, the accumulation remains even to a greater degree than represented. The numerous connections between these filthy sewers and the houses become then so many channels to conduct foul air into their interiors." Again, in referring to the sections, (*see plate figs.* 4, 5, 6.) he says: "They are intended to represent also the general condition of many sewers in all parts of the city; in fact, except when the grades are steep, or where a large area is drained through one channel, the sewers are rarely found free from deposit in some degree. This state of things is peculiarly the case about Madison square, and above as high as Twenty-ninth street. There are three instances in this neighborhood in which the flow of sewerage is forced against grade, and, in nearly all, the grades are so slight as to favor the accumulation of solid matter to a most troubelsome degree. Through much of the lower portion of the city, along the North and East rivers, the same process is going on in the sewers. In the sections (*see plate.*) it will be noticed that the actual stream flowing, as indicated by the red shading, is extremely small in proportion to the size of the sewer and to the amount of the deposit. In most of the lateral drains, except during the progress of a storm, the actual flow is reduced to a mere driblet, without force or current, only enough to soak into the deposit it had already built up, and keep it sufficiently wet for favorable decomposition. The effect of the storm flow, in such sewers, although considerable; is not enough to remove the nuisance. It often does nothing more than move a portion and pile it up somewhere else." In view of the wretched condition in which the preceding expose of our sewerage system has shown to exist, it becomes a matter of the first importance to inquire as to the probable effect, upon the health of our community of such appalling deposits of filth underlying the city, exhaling, as they must, into our very sleeping chambers their mephitic vapors.

"On general principles, we can safely assert, that every form of disease, of whatever character, would take on a more virulent and deadly form in consequence. That this assertioa has been borne out by the facts, is as certain as that our people have willfully or ignorantly shut their eyes to this terrible state of things.

"The scope of this report does not contemplate an extended statistical resume of a subject of the magnitude which the rigid investigation of our mortuary record would present, and, nothing short of this, can show the proportion of the deaths in badly sewered localities to those where the sewerage is properly disposed of. It is perhaps not irrelevant to state, that persons residing in the immediate vicinity of obstructed sewers are not the only ones to suffer, for, once a sewer be wholly closed at any point, the poisonous gases which are constantly and rapidly disengaged, are forced backward through the connecting sewers, and by means of the drain pipes, even into the very sleeping apartments, of houses far distant from the point of obstructions.

"No plumbers' trap, yet invented, can prevent the passage of foul air as above described."

The remark or suggestion "flush" to the sewers—or let in a large amount of water to clean them out. I am unable to think of any means which would "flush" the sewers more than the heavy thunder storms which so often happen every season, but the accumulated dirt still remains, nor will one or more grand exits at the Battery or other places relieve this difficulty; but the use of the Dirt-Catchers placed as proposed will accumulate the dirt, as it only has to pass about 250 feet before it is arrested, and should a sewer be dirty it will gradually wash down, into the cistern or the dirt catcher, which as before explained, is below the bottom of the sewer.

The basins as now built at the corners of the streets are only recept~~i~~acles of filth, covered with stagnant water and prevent the gases from passing out, but the dirt-catcher is a recept~~i~~acle, also covered with water, which is always changing, and the gases which accumulate would be less, and are dissipated, somewhere—and it is far better for them to come out of the culverts at corners of the streets, than to be forced into the sleeping apartments of houses, as they now are by the present arrangements of sewers and culverts. These are the various causes which are destructive to health, and constitute the Moloch to whom is offered up the human sacrifice, for investigation establishes as a scientific fact, that there are not less than two hundred thousand cases of sickness annually in the city which might be avoided; and the mortuary statistics show, that from twelve to fifteen thousand human lives are annually sacrified unnecessarily from the causes above enumerated."

New York, April 13*th*, 1855.

Mr. J. E. Serrell,

DEAR SIR:—In reply to your enquiry, concerning the cleaning of sewers, I have been in the employ of the Croton Aqueduct Department of this city nearly eight years as Superintendent of cleaning and repairing sewers, etc., and begin to think that my knowledge of the business is about perfected, and Sir, I have had to clean the dirt-catcher constructed in the sewer in Twenty-seventh street, and for my own satisfaction, minuted the expense, and compared it with the expense of cleaning a sewer of the same size and length in Eleventh street, between avenue C, and Dry Dock street, the former cost $12, the latter nearly $200, and the men tell me, they would sooner work one week in the chamber of the dirt-catcher, than one day in the sewer, for the reason that in cleaning sewers, they are wet from the time they enter them in the morning, until they come out in the evening; and further the position they are placed in cleaning the sewer is very laborious, as they are obliged to stoop the whole time, and receive the dripping from the crown of the sewer upon their backs whilst they are carrying and shoveling the mud and taking it to the openings which are 100 feet apart; but in the dirt-catcher it is not so, as it is of sufficient capacity, and has a partition making two basins of it. The men have an opportunity to stand erect, and by the aid of a small temporary dam, they may work all day quite dry and let the water pass, which is always running through the sewer. The dam above spoken of turns the course of the water through one division, whilst the men are clearing the other. Now, Sir, in my opinion if the dirt-catchers were in general use, the expense of cleaning sewers would be reduced to one-fourth of what it now costs and the laborers employed in them would be enabled to follow it for years, whereas now no man can stand it over two years and but few over one.

Very Respectfully Yours,
SAMUEL R. SMITH,
No. 54 Stanton Street.

CITY INSPECTOR'S DEPARTMENT.

New York, May 22, 1855.

Mr. J. E. Serrell,

SIR:—The necessity for improvements in the construction of sewers, has long been evident to the authorities of our city, and any suggestion which shall serve to remedy some if not all, the defects, must be received with favor. During my official term my attention has been drawn, to evils resulting from the sewers, among which, I will mention the following, which your plan of construction,—"dirt-catchers,"—will in part, if not wholly remove, if adopted by the Corporation.

1st. From the offensiveness of the deposits at the bottom of sewers and draft through the sewers, the houses of persons who have had their premises connected with the sewers are rendered oft times very unpleasant.

2nd. The length of time which it is required that "manholes" shall be left open, while cleaning the sewers.

3d. The Croton Aqueduct Department objecting to the drainage of vacant lots upon which the water lies until it becomes stagnant and offensive, and which if drained by sewer connections would by the wash of sand and by rains, soon stop the sewers; injuring the sewers and private property connected therewith.

4th. The filling in of slips on the rivers where sewers empty and from the deposit at low tide rendering the condition of the slip a nuisance of the most offensive and objectionable nature.

From the examination of your plans, I am satisfied much good will result, in many cases, as for instance, in the matter of the sunken lots, when if drained it will become unnecessary to fill in, and besides abating the nuisance in a perfect manner, it will be with the saving of great expense. The advantages as a remedy for the other evils I have mentioned to be gained by the adoption of the "dirt-catcher" will readily suggest themselves to the minds of persons subjected to the annoyances alluded to.

Respectfully and Truly Yours,

THOMAS K. DOWNING,

City Inspector.

New York, December 1864.

To the Secretary of the Council of Hygiene:

The original water courses in the city of New York, are in many instances deeper than the sewers built in the streets and avenues, and will be more so in the progress of the improvements hereafter.

In 1848–49, and even since that period my time was much occupied in draining large portions of the city by opening the original water courses; and in a communication to the Common Council, dated February 1850, I urged the necessity of this system of drainage, stating that in cases of building, or filling in streets or lots, I had, in every case under my control, invariably kept the original water courses open, particularly when *below* the sewers built or to be built in the streets or avenues.

The following are the instances fresh in my memory:

1st. Third avenue and 42nd street old water course runs south, also Madison and 5th avenues, 31st, 32nd and 33d streets to Lexington avenue.

2nd. Fifty-first street and 2nd avenue, in which case I built an opening in the bottom of the sewer, near 2d avenue, to allow the water from the sewer to pass into the original water course, this sewer is above the water course about 5 feet. That the stoppage of this water course under 2d avenue, near 48th street, flooded the whole neighborhood, and a Mr. Reed in ~~50~~56th street, near 3d avenue ~~and 54th st.~~, sued the city, and obtained damages, (in this suit I appeared as a witness) that the original water course at this place is about 8 feet below the bottom of the sewer, now built in 54th street, between 2nd and 3d avenues, and that the bed of this water course, which runs about north and south, (its course will be seen by Randal's Map of the City,) and is much deeper than the bottom of the sewer now built to drain this vicinity, as will be seen by referring to the profile in the Croton office, which includes at least 300 acres of drainage. That the common law of the land provides, that all original water courses shall not be closed to the detriment of any owner on the line of such water course.

That a part of the 300 acres above referred to, are situated between 4th and 5th avenues from 56th to 67th streets, opposite Central Park, (part of which is now used as skating ponds) and between 3d and 4th avenues, from 49th to 57th steeets, and at Lexington avenue, to 62nd street. At the time it was contemplated to construct the main sewer which is now built, it was proposed by me that it should be deeper, and carry off the water to the original depth of the water course, for the reason set forth in my report to the city in February, 1850, which says, "and avoid numerous nuisances consequent on the stagnant pools on the low lots, and be much advantage to the health of the city, and those who build on a street or avenue first, and improve and benefit the adjoining property and neighborhood, who have to contend with all the disadvantages of a new place, for the benefit of those who do nothing themselves, but are rich and able to wait until the hard working or pioneer men have done it for them," and again says, "has not only to contend with this disadvantage, but his health is impared from fever caused by impure vapors arising from the undrained lands, which shortens his days of usefulness."

New York, February 3d, 1862.

Mr J. E. Serrell,

Dear Sir:—I have in my official capacity as General Inspector of Sewers for the Croton Aqueduct Department, examined the sewer in 40th street, between 9th and 10th avenues, in which four of your silt basins or "dirt-catchers" were placed. The purpose of them is to deposit the dirt in compartments which are by their mode of construction so arranged as to enable those engaged cleaning them, to be free from water, while at work in the sewer, that when in the sewer, which is a part of my duty; I found that all the dirt was deposited in the basin and that the sewer was clean and would remain so, until these are filled, when of course they should be cleaned, and will prevent the dirt from passing from the sewer and flowing into the river.

Respectfully submitted,
WM. COWEN,
General Superintendent of Sewers and Repairs
for the Croton Acqueduct Department.

CROTON ACQUEDUCT DEPARTMENT.

New York, March 19th, 1862.

Mr. J. E. Serrell,

Dear Sir:—Having used the "dirt-catchers" in the sewers in 27th and 40th streets, and find that they answer the purpose for which they were constructed, viz: the accumulation of the filth at a given point, thereby rendering its removal less expensive, and the prevention of the solid matter passing into the slips and filling them up, which is expensive in removing and detrimental to the commercial interests of the city. We would respectfully ask permission to use the same in the sewers built hereafter, providing that any interest you may have in the same, may not be effected thereby.

Yours Respectfully,
THOS. B. TAPPEN,
Assistant Commissioner.

What is now required to be done to make the sewerage of the city of New York the most effective in the shortest time, and at the least expense, is to rebuild such portions of the sewers, now at an improper grade, by raising or lowering the uneven bottoms of the present sewers, to the proper grades, to build "dirt-catchers" of the required size, and altering all the basins at the corner of the streets into sluice-ways, instead of trapped receptacles of dirt and stagnant water, as they are now. The worst places could be remedied in one month. The work of altering to be begun at the rivers. In the fall and winter, when the air in the sewers is the warmest, it ascends, finding its way into all the houses, where the least opportunity is afforded, and if possible should be altered before next winter.